REMARKS

In an Office Action dated March 27, 2003, claims 1-7, all of the claims under consideration in the subject patent application, claim 8 being withdrawn from consideration, were rejected. By amendment above claim 1 has been rewritten. Support for the amendments in claim 1 can be found in the original claim 1. Support for new claim 9 can be found on page 7, lines 18-22.

A restriction requirement under 35 U.S.C. § 121 was issued prior to the Office Action by telephone. The Examiner requested restriction to either group I (Claims 1-7, drawn to an LPCVD apparatus) or Group II (Claim 8, drawn to a method of manufacturing a thin film). Applicant affirms that he has elected with traverse to prosecuted the invention of Group I, claims 1-7. Claim 8 is withdrawn from further consideration by the examiner as being drawn to a non-elected invention.

Reconsideration of this application and allowance of the claims is respectfully requested in view of the foregoing amendments and the following remarks.

The Examiner has rejected claims 1-7 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The Examiner stated that the term "on which a thin film being precipitated" in claim 1 is grammatically incorrect. Applicant has rewritten claim 1 to read "on which a thin film is precipitated" and submits that claim more clearly defines the subject matter of the invention with no change in claim scope. Withdrawal of the rejection of claim 1-7 under 35 U.S.C. § 112, second paragraph is respectfully requested.

The Examiner has rejected claims 1-7 under 35 U.S.C. § 103(a) as being unpatentable over Fujikawa et al. (US 5,704,214) in view of Calton et al. (US 5,649,428). According to the Examiner the reference teaches a LPCVD apparatus with a trap provided upstream of an exhaust pump and cooling used raw material gas supplied from a reactor. The Examiner further asserted that Fujikawa et al. teaches a LPCVD apparatus with a trap-pressure-regulating valve, with a back flow valve, and with a by-pass pipe which bypasses the trap, which by-pass pipe can have a back-flow valve. However, the Examiner recognizes that Fujikawa et al. does not teach that the trap in the LPCVD apparatus is provided with a honeycomb-structure cylindrical filler in a flowing passage through which the used raw material flows. Further, according to the Examiner the Fujikawa et al. reference does not teach the length of the honeycomb-structure cylindrical filler and the maximum diameter of the passage holes of the filler. The Examiner further recognizes that Fujikawa et al. does not teach a bypass for the trap wherein the bypass is provided at both ends with a back-flow valve.

In addition, the examiner asserts that Calton et al. teaches a gas trap with a honeycomb structure, without increasing the size of the gas trap which would have negative effects on the ability of the LPCVD system to maintain its operational pressure. According to the Examiner it would have been obvious to replace Fujikawa's trap with Calton's gas trap with honeycomb structure cylindrical fillers, change the dimensions of Calton's honeycomb structure and add a second back flow valve to Fujikawa's bypass pipe which already has one back flow valve.

The present invention claims a LPCVD apparatus with a gas trap which is provided with honeycomb-structure cylindrical fillers in a flowing passage through which the used raw material

flows. It is a critical feature of the invention that in the LPCVD apparatus gas trap the honeycomb structure cylindrical fillers are provided so as to recapture raw material which otherwise would be lost in the exhaust of the LPCVD apparatus.

The gas trap in Fujikawa et al. is located upstream of the pumps for the exhaust of the apparatus so as to diminish the amount of raw material gas in the exhaust. However, the Fujikawa et al. gas trap is a similar trap to the traps discussed in the background section of the present specification, wherein the inventors discuss the problem of removing raw material from the exhaust. In the prior art traps the efficiency of the traps was insufficient in order to remove substantially all the raw material from the exhaust. As is shown in figures 2 and 3 of Fujikawa et al., the gas trap itself, although removable, is a conventional trap as used in the prior art discussed in the specification.

The reference does not teach or suggest increasing the cooling efficiency by including a honeycomb structure in the trap. Cooling efficiency as taught by Fujikawa et al. is accomplished by changing the temperature of the coolant and the angle of the fins (four fins) in the trap. Although positioning of the fins within the trap may increase the efficiency of contact between the raw material gas and the fins, the reference in no way suggests inserting a honeycomb structure cylindrical filler in the gas trap to increase the available surface area of cooling in the gas trap.

Furthermore, Fujikawa's apparatus intends to produce TiN thin film, wherein TDEAT is used as a raw material. The reference teaches that TDEAT is a liquid, which has high viscosity at room temperature. Fujikawa et al. use a trap to remove unreacted TDEAT from the spent raw

material, and in the trap, fins are used as a cooling means for the spent raw material (see, for example claim 2). It is impossible to use a honeycomb structure in the trap of Fujikawa et al. because TDEAT, having high viscosity at room temperature, would cause blockage in a honeycomb structure trap. This would undermine the operation of the trap, in particular when such a trap according to the present invention has a passage diameter ranging 0.5-10 mm. Therefore, Fujikawa et al.. employ fins as a cooling means and not a honeycomb structure.

In fact, Fujikawa et al. recognize the limitations of the gas trap in their invention as the reference discloses that the choices for the angle of the fins is limited in that at a certain angle the flow speed diminishes. The reduced flow speed through the trap is detrimental to the operation of the CVD apparatus. Therefore, although Fujikawa et al. recognize the limitations of the gas trap, there is no teaching or suggestion to correct the problem by including the honeycomb structure as claimed in the present invention. This defect is not cured by Calton et al., a reference in the field of air conditioning systems, which is non-analogous art with respect to Fujikawa et al., a reference in the field of providing a CVD apparatus.

The Calton et al. reference discloses a moisture transfer wheel in an air conditioning system to capture water from air. A moisture transfer wheel however is not a gas trap as the Examiner asserts. Therefore, the inventions in Calton et al. and Fujikawa et al. are very different and do not relate to the same art. Thus Calton et al. and Fujikawa et al. are references in non-analogous art areas, and one ordinary skill in the art of CVD apparatuses, as in the present invention and in Fujikawa et al., would not look to Calton et al., a reference in the field of air conditioning systems.

In addition, there is no motivation to combine Calton et al. as the reference does not teach anything at all about the length of the honeycomb structure and the diameter of the cylindrical holes in the structure. The Examiner asserts that it is well established that changes in apparatus dimensions are within the level of ordinary skill in the art. However, the test here is whether the dimensions of both the length of the honeycomb structure and the diameter of the cylindrical holes in the structure are obvious in a gas trap in a LPCVD apparatus. The dimensions for the honeycomb structure are dictated by its use in trapping raw material gas in the gas trap. Applicant submits that the dimensions are dictated by the size of the trap which size itself is dictated by the fact that low pressure should be maintained while the efficiency of raw material capture in the trap is optimized. Similarly, the dimensions of the diameter of the cylindrical holes in the structure are dictated by the requirement for optimal recapture of raw material while at the same time maintaining adequate gas flow speed.

Thus, in the present invention a particular problem is being solved with respect to a gas trap in a LPCVD apparatus in order, to recycle raw material. The teaching in Calton et al. is directed to a moisture transfer wheel where these dimensional restrictions, as required for the structure in the LPCVD apparatus gas trap, do not apply because Calton et al. is only concerned with absorbing moisture from air. Therefore, nothing in Calton et al. teaches or suggests the dimensions specified in the present claims with respect to the honeycomb structure in the gas trap in a LPCVD apparatus, and the dimensions of the honeycomb structure in the present invention, which are critical to the operation of the LPCVD apparatus with the gas trap, are not obvious.

Finally, the Examiner asserts that adding a second back flow valve to Fujikawa et al.'s by-pass pipe that already has one back flow valve to provide additional piping isolation is obvious as duplication of parts is obvious. However, Fujikawa et al. does not teach the LPCVD apparatus with a gas trap as claimed in independent claim 1. The dependent claims 5-7, directed to the bypass pipe in a LPCVD apparatus according to claim 1, are therefore also non-obvious by virtue of their dependency.

Applicant respectfully submits that the claimed invention in claims 1-7, as amended, is unobvious over Fujikawa et al. in view of Calton et al., as the Fujikawa et al. reference does not teach or suggest a honeycomb structure cylindrical filler in the gas trap and there is no motivation to combine Calton et al. with Fujikawa et al. Withdrawal of the rejection is respectfully requested.

Applicants submit that the present application is now in condition for allowance. Reconsideration and favorable action are earnestly requested.

RESPECTFULLY SUBMITTED,					
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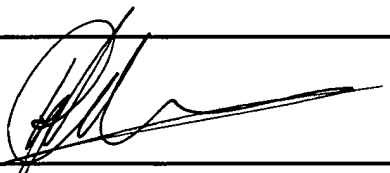
SIGNATURE				DATE	6/27/03
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Amended Claim 1: Version with markings to show changes made

1. (Amended) An LPCVD apparatus comprising, a container for accommodating an organometallic compound, said compound serving as a raw material; a heating means for heating the container and vaporizing the organometallic compound to obtain a raw material gas; a reactor for accommodating a substrate on which a thin film is [being] precipitated; an exhaust pump for maintaining a low pressure atmosphere within the reactor; and a trap provided on the upstream of the exhaust pump and cooling used raw material gas supplied from the reactor, wherein said trap is provided with honeycomb-structure cylindrical fillers in a flowing passage through which the used raw material flows.